D 9.1 Project Presentation
“Maintenance is no longer a necessary evil that costs what it costs, but an important function that creates additional value in the business process”

“New business models with a stronger service orientation are seen as an instrument to react to the upcoming competition and future challenges”
Consortium

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How can I optimize my maintenance plan?

How can I perform in depth root cause failure analysis on my process and equipment?

How do I achieve optimal equipment efficiency and availability?

What is the life expectancy of an asset’s component or part?

How can I predict an impending equipment failure and the cause?

How can I reduce unscheduled maintenance and its high costs?

How can I detect warranty issues sooner?
The main objective of MANTIS is to develop a Cyber Physical System based Pro-active Maintenance Service Platform Architecture enabling Collaborative Maintenance Ecosystems.
Objective

• Such a Collaborative Maintenance Ecosystem will be able to estimate future performance, to predict and prevent imminent failures and to schedule proactive maintenance:
  – Reduce the adverse impact of maintenance on productivity and costs
  – Increase the availability of assets
  – Reduce time required for maintenance tasks
  – Improve the quality of the maintenance service and products
  – Improve labor working conditions and maintenance performance
  – Increase sustainability by preventing material loss (due to out-of-tolerance production)
Specific objectives

- To define **the overall service platform architecture** of the MANTIS distributed system for proactive maintenance.
- To develop the next generation framework for **highly distributed sensing**, including preprocessing, **data acquisition and adaptive information processing** maintenance, the MANTIS Framework.
- To conceive a distributed **collaborative** maintenance **decision making** system.
- Provide **user-friendly, ergonomic and intuitive context-aware** human-machine interaction based on the MANTIS Maintenance Framework.
- To identify, define and implement **new business opportunities** through services provided by the MANTIS Framework.
- Establishing a higher **maturity** in the partner organisations regarding maintenance support.
- To generate society, business and technology **awareness** supporting the rapid exploitation of solutions demonstrated by MANTIS.
Embedded solutions

• New sensing CPS to capture maintenance relevant/critical information
• Virtual Plug & Play
  – Easy to configure and deploy complex maintenance services
• Secure wireless solutions
  – Increasing the possibility to reach inaccessible places for a wired network
• Remote access that facilitate access to new geographic markets
• Distributed (local) decision making
• Connection to the Cloud enabling new capabilities for data aggregation and complex computing
• Distributed Big Data analysis with focus on critical data sources
Knowledge management

• For an enhanced advanced analytics methodology
  – Proactive asset maintenance
  – Root cause failure analysis
  – Remaining useful life identification
  – Simulation, prediction and scenario tools

• Information sources
  – Asset maintenance history
  – Condition monitoring and historical meter readings
  – Inventory and purchasing transactions
  – Labor, craft, skills, certifications and calendars
  – Safety and regulatory requirements
  – ERP, sensors, CMMs, SCADA,…
  – New CPS will provide relevant/critical data/information
  – Simulations
Context awareness

• Serving the right personnel with the right information at the right time

• Providing mobile extensions to solutions they offer
  – Operators and technicians are just now getting mobilized, as opposed to being confined to a control room viewing the process-control dashboard on fixed-position screens

• Combined with user-friendly, industry dashboards
Use cases

• Production asset maintenance will be validated in:
  – Shaver production plant
  – Pultrusion line
  – Press machine maintenance
  – Sheet metal working machinery
  – Compressor maintenance

• Vehicle maintenance management will be validated in:
  – Offroad and Special Purpose Vehicles
  – Railway systems

• Energy production asset management will be validated in:
  – Wind mills
  – Photovoltaic plants
  – Conventional energy production

• Health equipment maintenance will be validated in:
  – Health imaging systems
**MANTIS Service Platform Architecture**

- **Data sources (On-premises & Cloud):**
  - Open Data
  - CRM
  - CMMS
  - MES
  - Geo Information

- **Smart sensors and sensor networks from different vendors**

- **Collaborative assets from different vendors in a fleet**

- **Collaborative data sources from different vendors**

- **Collaboration with workers**

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Innovation potential

- on service platform architectures
  - basic CMMS usually do not have any means for condition monitoring which is needed for predictive maintenance
  - integration of various IT systems such as CAD, ERP, CMMS and condition monitoring
  - interoperability can be achieved at different levels: technical, syntactic, semantic and organisational
  - integration of data structures
  - there is still a lot to do in the area of linking together the IT systems that are needed to handle the total product life cycle in an optimal way

- on real-time smart sensing and data acquisition technologies
  - new high quality sensors for condition monitoring
  - requirements for the reliability and accuracy are very high
  - Physical system integration of sensors in structures or machinery and actuators is a difficult task.

- on networking in challenging environments
  - Even though the development of wireless connections has been very rapid in this sector
    the amount of data from dynamic sensors is a challenge
  - Energy harvesting
  - Reduction of BW needs
Innovation potential

• on analysis and decision making technologies
  – The wear of components of production machinery is very complex and there are quite a high number of factors
  – distributed decision making
  – Adaptive maintenance planning based on actual customer needs such as ambient conditions, assignment and/or task supporting business models based on service contracts that are adapted to the actual situation
  – new developments in DM as well as in machine learning, have originated methods that can deal with the complex types of data considered in this project

• on human-machine interaction
  – user-centered design applied in human-machine interaction
Innovation potential

• on maintenance of manufacturing assets
  – maintenance tasks are conducted either when an error occurs or according to the manual and/or standards
  – industrial machines rely on proven and well established industrial cabled sensor technologies with limited functionalities
  – data analysis in maintenance of manufacturing assets is often quite superficial
  – added value will be on understanding data and distribute the contained knowledge to end-users
Impact

- **Competitiveness (C)**
  - Reduction of unscheduled maintenance and its high costs
  - Optimised maintenance windows to reduce operating expense
  - Avoid unnecessary investments in redundancy
  - Minimise parts inventory
  - Increased equipment lifetime

- **Assets Availability (A)**
  - Unexpected failures reduction
  - Repair and overhaul time reduced
  - Improved reliability and uptime of assets
Impact

• Sustainability (S)
  – Lower energy and raw materials need
  – Lower CO2 footprint through full life cycle use and components re-use
  – Reduction in spare part consumption thus, smaller stock of spares
  – Increased plant safety
  – Work orders down
  – Efficient assignment of labour resources
  – More friendly and attractive working environments
  – Preparing the next generation of knowledge-workers
  – Improved competitiveness
  – Employment sustainability and new job creation based on new business models and opportunities
  – Stimulating societal cohesion by value added production instead of price competition
  – Increased life expectancy of ageing factories
  – Internationalisation opportunities
  – Key components re-use (rental or second-hand asset market)
Business opportunities

- **Servitization** of maintenance (added value and competitiveness)
- **Ageing factories**: Competitive for longer time
- Key components **re-use** (rental or second-hand asset market)
- **New** hardware, software and application developers
- **Internationalization** opportunities
Implementation

WP9 - Project management

WP2 - Service platform architecture development

WP3 - Smart sensing and data acquisition technologies

WP4 - Analysis and decision making functionalities

WP5 - HMI design and development

WP6 - Business impact and models

WP7 - Validation of MANTIS solutions in relevant scenarios

WP8 - Dissemination of knowledge and exploitation

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### Timing

#### MANTIS - Work packages and tasks

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